PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference Cal 87220	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/14059	International filing date *(day/month/year)* 05.12.2003	Priority date *(day/month/year)* 16.12.2002
International Patent Classification (IPC) or both national classification and IPC F04B51/00		
Applicant NUOVO PIGNONE HOLDING S.P.A. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
26.03.2004	28.07.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Gnüchtel, F Telephone No. +49 89 2399-2012

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/14059

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-12 as originally filed

Claims, Numbers

1-3 filed with telefax on 19.07.2004

Drawings, Sheets

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-3
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-3
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-3
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement under Article 35(2) PCT with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

V.1 Document **US-A-5,209,076 (= D1)**, considered the most relevant prior art cited in the international search report, discloses a compressor monitoring system comprising signal measuring means and comparison processing means as defined by respective subject-matter of method claim 1 and system claim 2.

The respective subject-matter of claims 1 and 2 differs from the compressor monitoring system as disclosed in document **D1** in that the database comprises a matrix in which each row represents critical values of the measured operational parameters associated with a specific anomaly.

The technical problem to be solved by this distinguishing feature is the provision of an enhanced possibility of monitoring a compressor on the basis of information obtained from the measurement of multiple operating parameters.

The compressor monitoring system known from document **D1** merely provides for an alarm signal or a compressor shut-down, in case a measured operating parameter exceeds a fixed reference value. No information concerning a specific anomaly appears to be determined by said compressor monitoring system of document **D1**.

Document **US-B-6,448,982 (= D2)** discloses monitoring system, wherein a matrix database is being provided. Said matrix database serves to realize a sequence of cause-and-effect relationships between a measured operating parameter and elements of the apparatus/process being monitored. For example, said matrix database enables to define a fixed trip definition for the apparatus/process being monitored associated with a fixed reference value of a measured operating parameter. Said cause-and-effect matrix of document **D2** does not appear to render obvious the determination of a specific anomaly of the monitored apparatus/process based on the analysis of various measured parameters.

The monitoring systems disclosed in the other documents cited in the international search report appear to be less relevant.

The respective subject-matter of claims 1 and 2 therefore fulfills the requirements of novelty and inventive step in the sense of Article 33(2) and (3) PCT.

V.2 Dependent claim 3 is referring back to claim 2, and hence its subject-matter appears to be also new and inventive in the sense of the PCT.

V.3 The claimed compressor monitoring system is considered to be industrially applicable in the sense of Article 33(4) PCT, for example in the technical field of air or gas transportation.

CLAIMS

1. Method for monitoring a reciprocating compressor, comprising the following steps:

- receiving a plurality of signals corresponding to parameters relating to the operating state of the compressor,
- comparing the measured values of these parameters with critical values contained in a database comprising a matrix in which each row represents critical values of the said parameters relating to the operating state of the compressor associated with a specific anomaly,
- sending a signal according to the match between the measured values and the critical values, the signal representing ~~an~~ said specific anomaly of the operating state of the compressor.

~~2. Method according to Claim 1, in which the said database comprises a matrix in which each row represents critical values of the said parameters relating to the operating state of the compressor associated with a specific anomaly.~~

~~3~~ 2. System for monitoring a reciprocating compressor,

comprising:

an unit for measuring parameters relating to the operating state of the compressor,

a processing unit for comparing the measured values of the parameters with critical values contained in a database associated with the said processing unit, and for sending a signal according to the match between the measured values and the critical values, this signal representing an anomaly of the operating state of the compressor,

said database comprising a matrix in which each row represents critical values of the said parameters relating to the operating state of the compressor associated with a specific anomaly.

~~4. System according to Claim 3, in which the said database comprises a matrix in which each row represents critical values of the said parameters relating to the operating state of the compressor associated with a specific anomaly.~~

~~5~~ 3. System according to Claim ~~3~~ 1 and 2, in which the said measuring unit comprises at least one sensor of at least one of the said parameters relating to the operating state of the compressor.